

## **REMARKS**

1. In response to the Office Action mailed May 5, 2006, Applicant respectfully requests reconsideration. Claims 1-26 were originally presented for examination. Claims 1-26 were rejected in the outstanding Office Action. By the foregoing Amendments, claims 1, 5, 10, 11, 17 and 22 have been amended. No claims have been canceled or added. Thus, upon entry of this paper, claims 1-26 will remain pending in this application. Of these twenty-six (26) claims, four (4) claims (claims 1, 10, 17 and 22) are independent. Based on the above Amendments and following Remarks, Applicant respectfully requests that all outstanding objections and rejections be reconsidered, and that they be withdrawn.

### ***Art of Record***

2. Applicant acknowledges receipt of form PTO-892 identifying additional references made of record by the Examiner.

3. Applicant thanks the Examiner for returning form PTO-1449 filed by Applicant on April 22, 2004 which has been initialed by the Examiner indicating consideration of the references cited therein.

### ***Drawings***

4. Applicant notes with appreciation the Examiner's indication that the drawings filed on April 22, 2005 have been accepted as formal drawings.

### ***Claim Objections***

5. The Examiner objected to the claims 5 and 11 for informalities. Applicant has amended claims 5 and 11 to accommodate these objections. Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the claim objections.

### ***Claim Rejections***

6. Independent claim 1 and dependent claims 2-5 and 7-8 have been rejected under 35 U.S.C §102(e) as being anticipated by U.S. Publication No. 20030204664 to Bennett

(hereinafter, “Bennett”). Also, dependent claim 6 has been rejected under U.S.C §103(a) as being unpatentable over Bennett in view of U.S. Patent No. 6,275,919 to Johnson (hereinafter, “Johnson”). Independent claims 10, 17 and 22 and dependent claims 9, 11-16, 18-21 and 23-26 have been rejected under U.S.C §103(a) as being unpatentable over Bennett and U.S. Publication No. 20020138648 to Liu (hereinafter, “Liu”). Based on the above Amendments and following Remarks, Applicant respectfully requests that these rejections be reconsidered, and that they be withdrawn.

7. Independent claim 1 recites “[a] method for storing replacement data in a multi-way associative cache comprising at least one cache set, the method comprising: logically dividing the cache’s cache sets into segments of at least one cache way; searching a cache set in accordance with a segment search sequence for a segment currently comprising a way which has not yet been accessed during a current cycle of the segment search sequence; searching the current segment in accordance with a way search sequence for a way which has not yet been accessed during a current way search cycle; and storing the replacement data in a first way which has not yet been accessed during a current cycle of the way search sequence.” (*See*, Applicant’s claim 1, above.)

8. In rejecting claim 1, the Examiner essentially relied on one function of Bennett (i.e., the function described in para. 0028 of Bennett) for teaching these two distinct limitations of claim 1. Applicant respectfully submits that, for the reasons set out below, the Examiner’s reliance on Bennett is misplaced.

9. Bennett is directed to a cache system with multiway steering for cache access and modified cyclic reuse for cache allocation. (*See*, Bennett at para. 0001.) In the system of Bennett each cache cell has a usage bit which is set when the cell is used. (*See*, Bennett at para. 0028.) When searching for an available cache cell in which to store new data, a replacement search module 20 initially points to a cache cell. If the usage bit is not set, the new data is stored in this cache cell. (*See*, Bennett at para. 0028.) If the usage bit is set, the bit is then reset (i.e., cleared) and the replacement search module 20 advances to the next cache cell and checks its usage bit. (*See*, Bennett at para. 0028.) This process then continues until a cache cell is found where the usage bit is clear (i.e., not set). (*See*, Bennett at para. 0028.) Accordingly, in the system of Bennett, the replacement search module 20 searches for a cache cell whose usage bit is not set. Bennett, however, does not disclose segments comprising ways, nor searching for a segment comprising a way which

has not been accessed. Rather, as noted above, Bennett simply teaches cyclically searching a cache by moving from cache cell to cache cell for an available cache cell.

10. The Examiner also relied on para. 0005 of Bennett in support of the rejection of claim 1. This portion of Bennett, however, discusses then-conventional techniques for searching a cache to determine whether the particular element can be retrieved from the cache or whether the element must be obtained from main memory (*See*, Bennett at para. 0001.) In contrast, paragraph 28 of Bennett is directed to locating an available cache cell, as described above. Bennett neither teaches or suggests that the convention technique for full associative searching (as described at para. 0005 of Bennett) is applicable to mechanism for locating an available cache cell (as discussed in para. 0028 of Bennett). Rather, Bennett treats these are separate and distinct searches.

11. As such, Applicant respectfully submits that Bennett fails to teach or suggest “searching a cache set in accordance with a segment search sequence for a segment currently comprising a way which has not yet been accessed during a current cycle of the segment search sequence,” as recited by claim 1. Applicants accordingly respectfully request that the Examiner reconsider and withdraw the rejection to claim 1 for at least this reason.

12. Applicants further respectfully request that the Examiner reconsider and withdraw the rejection to claim 1 for at least the following additional reason. As noted above, claim 1 also recites “searching the current segment in accordance with a way search sequence for a way which has not yet been accessed during a current way search cycle.” The Examiner asserts that the functions described at paragraph 0028 of Bennett are also analogous to this limitation of claim 1. As noted above, however, this portion (para. 0028) of Bennett merely discloses a single technique for searching for an available cache cell. Thus, Bennett fails to teach or suggest the noted limitation of “searching the current segment in accordance with a way search sequence” as well as the limitation of “searching a cache set in accordance with a segment search sequence...” Accordingly, Bennett fails to teach or suggest both limitations of Applicant’s claim 1. Nor does Bennett teach or suggest two separate search sequences as claimed. For at least this additional reason, Applicants respectfully submit that the rejection of claim 1 based on Bennett is improper and should be withdrawn.

13. Independent claim 10 recites, in part, “selecting, when no invalidated way is in the cache set, a current segment of a segment search sequence for an available way; and searching the current segment in accordance with a way search sequence, for a next way not yet accessed during a current cycle of the way search sequence.” Applicants accordingly respectfully submit that, for at least similar reasons to those discussed above, Bennett fails to teach or suggest both a segment search sequence and a way search sequence as claimed. Applicant further respectfully submits that Liu does not cure, nor has the Examiner alleged that it cures, the above-noted defect of Bennett. Applicant accordingly respectfully request that the Examiner reconsider and withdraw the rejection to claim 10 for at least this reason.

14. Independent claim 17 recites, in part, “cache controller ... comprising replacement logic that ...searches a cache set in accordance with a segment search sequence for a segment comprising a way which has not yet been accessed during a current cycle of the segment search sequence, and searches each segment in accordance with a way search sequence for a way which has not yet been accessed during a current way search cycle; and stores the replacement data in a first way which has not yet been accessed during a current cycle of the way search sequence..” Applicants accordingly respectfully submit that, for at least similar reasons to those discussed above, Bennett fails to teach or suggest both a segment search sequence and a way search sequence as claimed. Applicant further respectfully submits that Liu does not cure, nor has the Examiner alleged that it cures, the above-noted defect of Bennett. Applicant accordingly respectfully request that the Examiner reconsider and withdraw the rejection to claim 17 for at least this reason.

15. Independent claim 17 recites, in part, “means for storing, in response to a cache miss, replacement data in a way, if available, that contains invalidated data, and if not available, searches a cache set in accordance with a segment search sequence for a segment comprising a way which has not yet been accessed during a current cycle of the segment search sequence, and searches each segment in accordance with a way search sequence for a way which has not yet been accessed during a current way search cycle; and stores the replacement data in a first way which has not yet been accessed during a current cycle of the way search sequence.” Applicants accordingly respectfully submit that for at least similar reasons to those discussed above Bennett fails to teach or suggest both a segment search sequence and a way search sequence as claimed. Applicants further respectfully

submit that Liu does not cure, nor has the Examiner alleged that it cures, the above-noted defect of Bennett. Applicant accordingly respectfully request that the Examiner reconsider and withdraw the rejection to claim 17.

***Dependent Claims***

16. The dependent claims incorporate all of the subject matter of their respective independent claims and add additional subject matter which makes them *a fortiori* independently patentable over the art of record. Accordingly, Applicant respectfully requests that the outstanding rejections of the dependent claims be reconsidered and withdrawn.

***Conclusion***

17. In view of the foregoing, this application should be in condition for allowance. A notice to this effect is respectfully requested.

Respectfully submitted,



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July 19, 2006